

Emergence behaviour of *Onchidium damelii* Semper, 1882 (Gastropoda, Onchidiidae)

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The only published statement, that has been located, on the emergence behaviour of *Onchidium damelii* Semper 1882, is a single sentence comment by Dakin (1947) referring to a temperate region population in New South Wales.

The present observations were made at Cockle Bay, Magnetic Island (19° 11'S, 146° 50'E) offshore from Townsville, Queensland. This study site was chosen due to the accessibility of the area; the more typical North Queensland mangrove flora than on the adjacent mainland; and the local abundance of *Onchidium damelii*. Shanco (1975) has given a general listing of the molluscs of Magnetic Island wetlands and the mangrove stands in the area have been described as typical of the north eastern Australian mangrove flora (Macnae, 1966; Spenceley, 1982).

Kenny and Smith (1987) have described the distribution and population density of *O. damelii* relative to the flora, tidal heights and substrate at this location. The vertical tidal range of the species extends from approximately mean low water to mean high water, of neap tides and spreads through substrates of mud and sandy mud, as well as areas of mangrove. The mean spring and neap tidal ranges for Townsville harbour are 2.27 m and 0.59 m respectively (Queensland Department of Harbours and Marine, 1981). Easton (1970) described the tidal pattern for the area as semidiurnal with significant diurnal inequality.

The study area was visited on 68 occasions (February to November, 1981 — 33 visits; March 1982 to January, 1984 — 26; July, 1985 — 6; July, 1986 — 3). Each visit was of several hours duration and observations were carried out at different stages of the tidal cycle and at various times of the night and day. Counts of emergent animals were made on four square metre units along standard strip transects and on random one square metre quadrats (see Kenny and Smith, 1987). General observations were made at each visit to the study area, as well as quantitative estimates. A total of 115 quantitative observations were made.

The greatest populations of *Onchidium* occurred in the following areas: (1) the *Avicennia* mangrove zone (near mean low water, neap tide); (2) the seaward *Rhizophora* mangrove zone (near mean sea level); and (3) the seaward *Ceriops* mangrove zone (near mean high water level). In these areas, where the substrate was suitable (see Kenny and Smith, 1987, in press) and during spring tide low water, middle of the day, daylight (times of maximum emergence), the mean counts of animals ranged from 0.9 ± 0.4 (S.D.) m^{-2} to 1.6 ± 0.4 (S.D.) m^{-2} (47 observations).

Quantitative observations of emergent animals from these three areas, in relation to tidal, diurnal and environmental conditions, produced the following results: (1) No *Onchidium* individuals occupied the tidal marsh areas when they were covered by seawater during the day or night (19 observations). (2) No animals emerged during the night when these areas were exposed to air (12 observations). (3) Few individuals (less than $0.01 m^{-2}$ range, 0 to 0.02; 9 observations) were observed during daylight neap tides when areas suitable for emergence were covered by seawater for only short periods of time, or not at all, over several days. (4) The number of animals emerging in areas, known to have high population densities, was low (less than $0.03 m^{-2}$ range, 0 to 0.07; 23 observations), when spring low tides occurred during the day, prior to 0900 or after 1600 hours local time.

General observations (5 observations) suggest that emergent onchidian numbers were considerably reduced when raining or when overcast, even at times of suitable tidal and diurnal conditions. In each population, animals appeared on the substrate surface (assuming suitable emergence conditions) after the descending water level had passed the particular area and approximately two hours prior to the time of low water. For any one population there was coincidence of emerged timing for individuals. No difference in emergence pattern, related to size of individuals, were noted. Animals remained active on the substrate surface for three to four hours but burrowed prior to being covered by the rising tide.

O. damelii emerged during low tide to feed and to reproduce. The control of *O. damelii* emergence during times of low tide appears to be determined by the tidal cycle; and a diurnal pattern but is apparently modified by physical factors, such as time and height of low tide, darkness and rain. Dakin (1947) described *O. damelii* as being active for two hours on falling tides only, but did not comment on any factors which may modify this pattern. The recorded absence of animals from the mud surface during night low tides is matched by the report (Arey and Crozier, 1921) that *O. floridanum* does not emerge at night, but *O. verruculatum* (changed from *O. peronii* by the author) has been observed feeding at night (McFarlane, 1979). The factors modifying the tidal pattern of activity are apparently not the same for different species within the Onchidiidae.

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